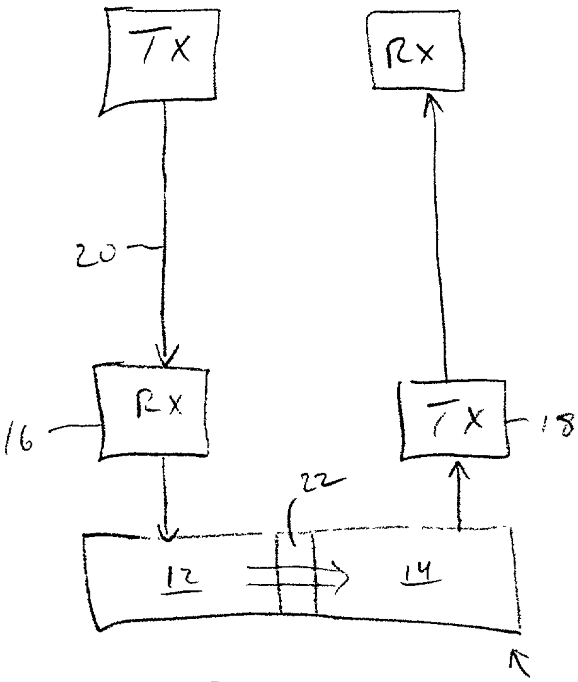


PRIOR ART

FIG. 1

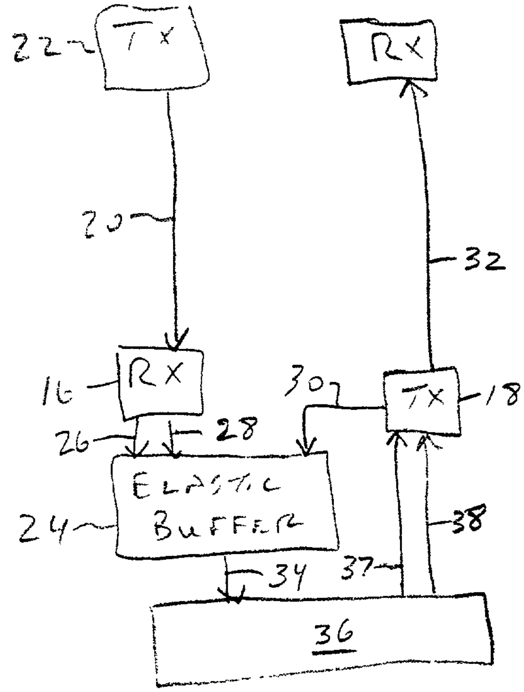


FIG. 2

Elastic Buffer Block Diagram

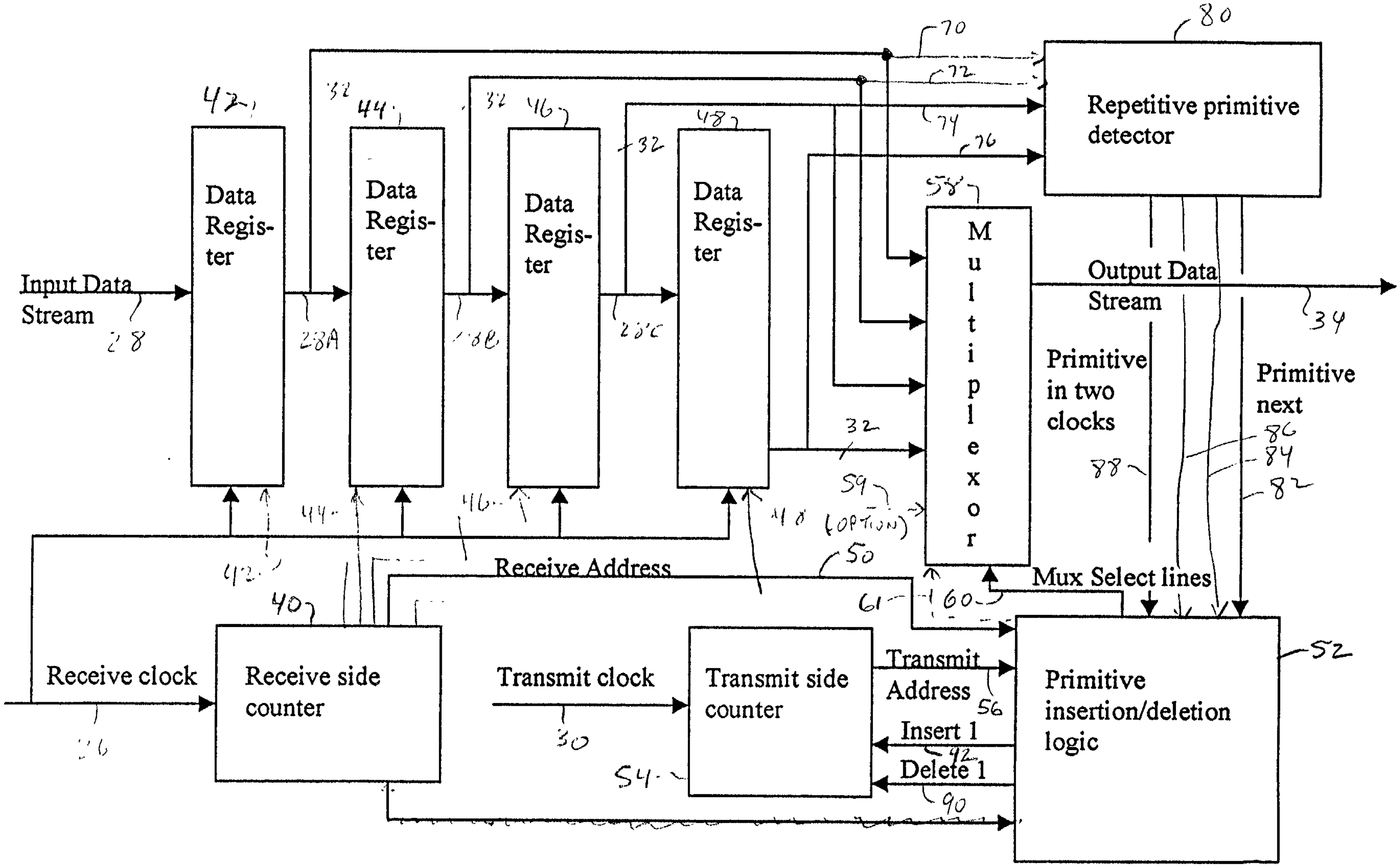
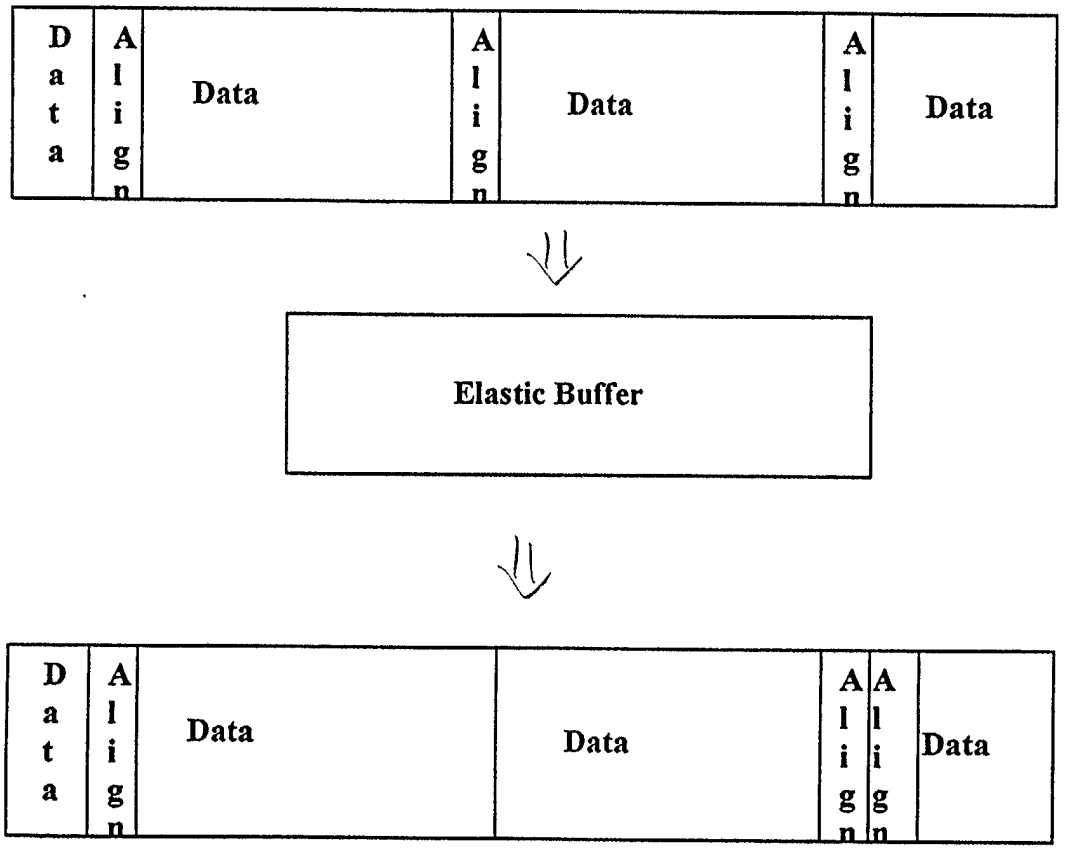


FIG. 3

APT Elastic Buffer Manager



Input data stream

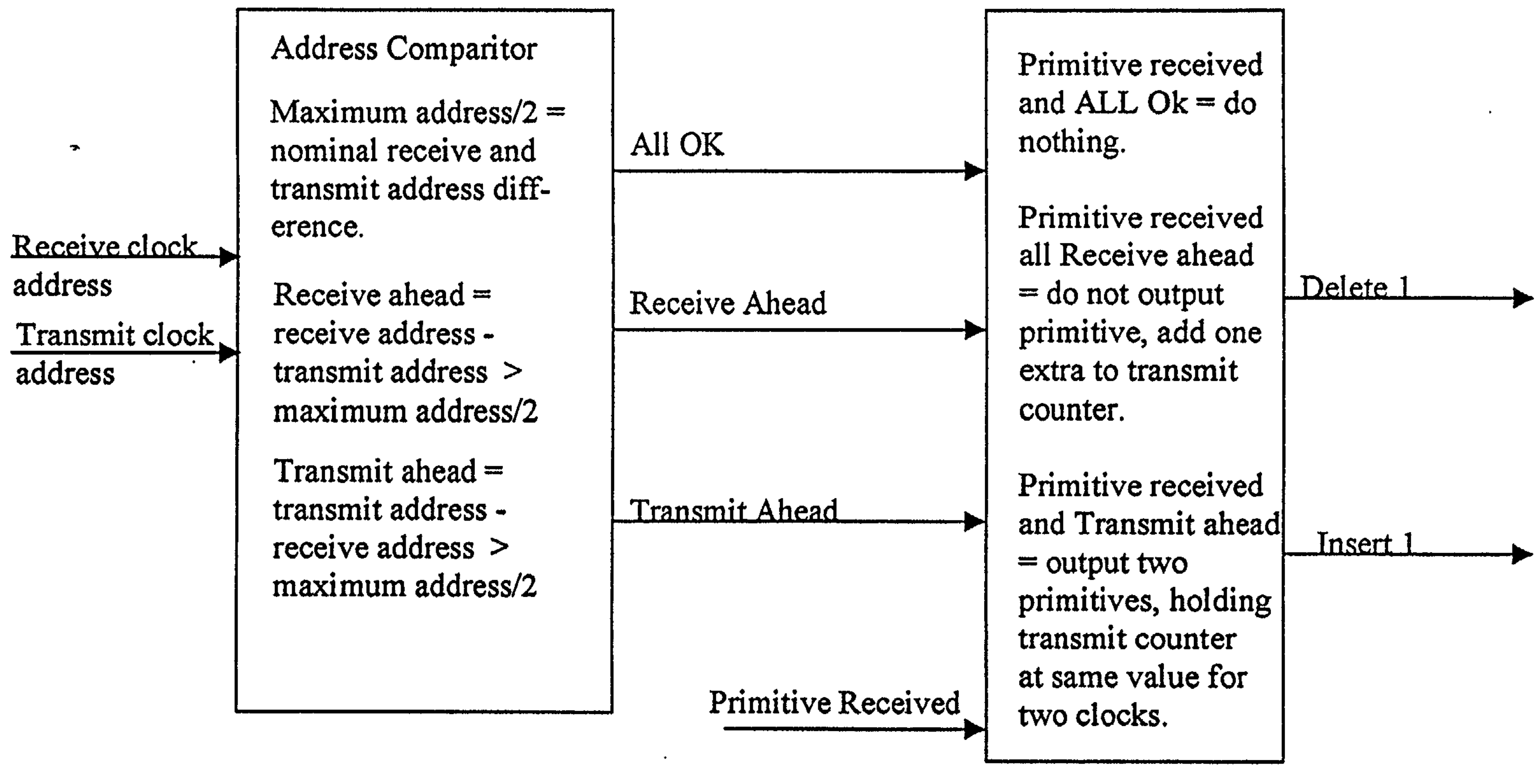
FIG. 1A

FIG. 4L

FIG. 1C

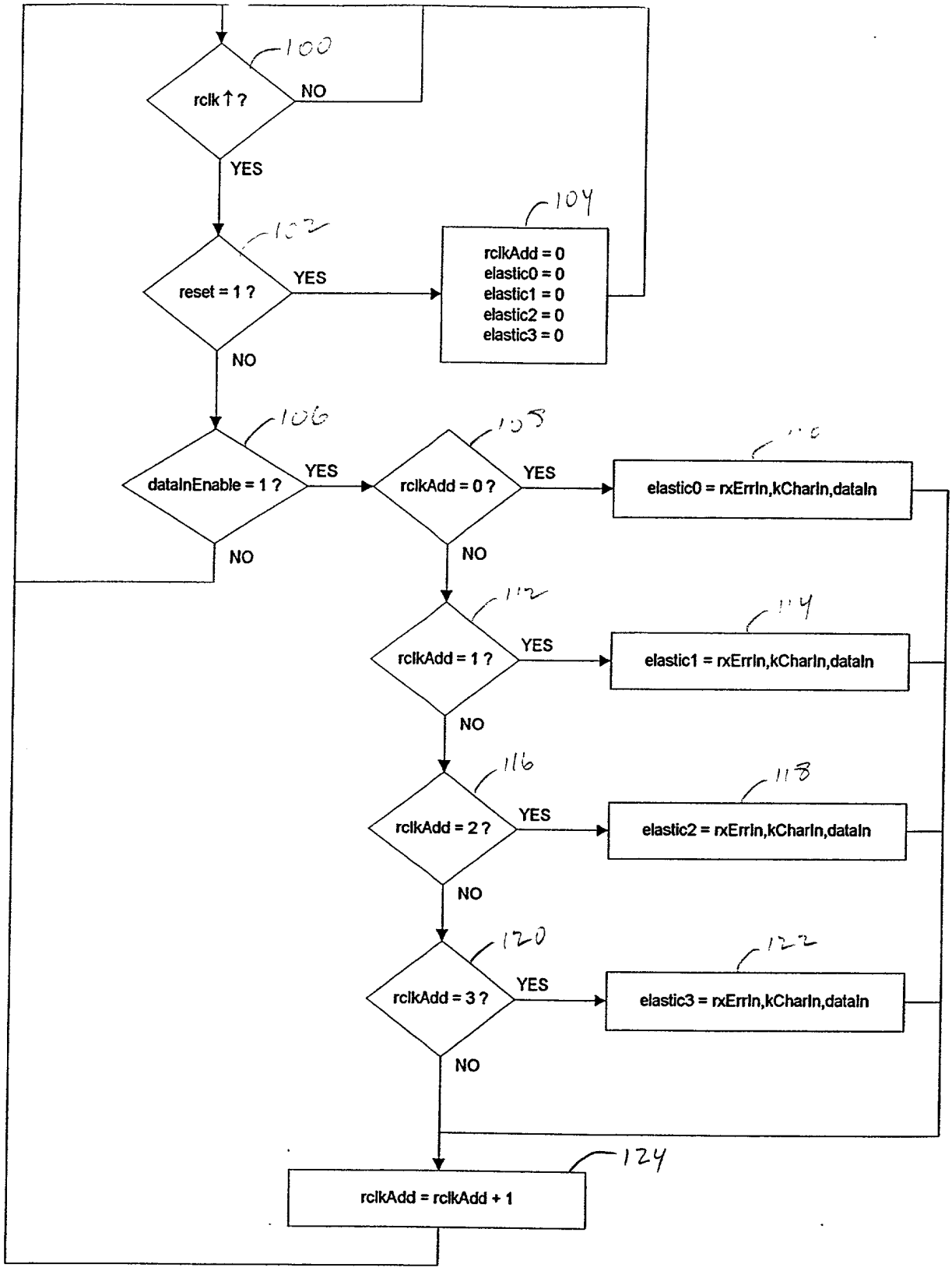
Output data stream

Primitive Insertion/Deletion Logic



Address Comparitor
Maximum address/2 = nominal receive and transmit address diff- erence.
Receive ahead = receive address - transmit address > maximum address/2
Transmit ahead = transmit address - receive address > maximum address/2
Receive clock address
Transmit clock address
All OK
Receive Ahead
Transmit Ahead
Primitive Received
Primitive received and ALL Ok = do nothing.
Primitive received all Receive ahead = do not output primitive, add one extra to transmit counter.
Primitive received and Transmit ahead = output two primitives, holding transmit counter at same value for two clocks.
Delete 1
Insert 1

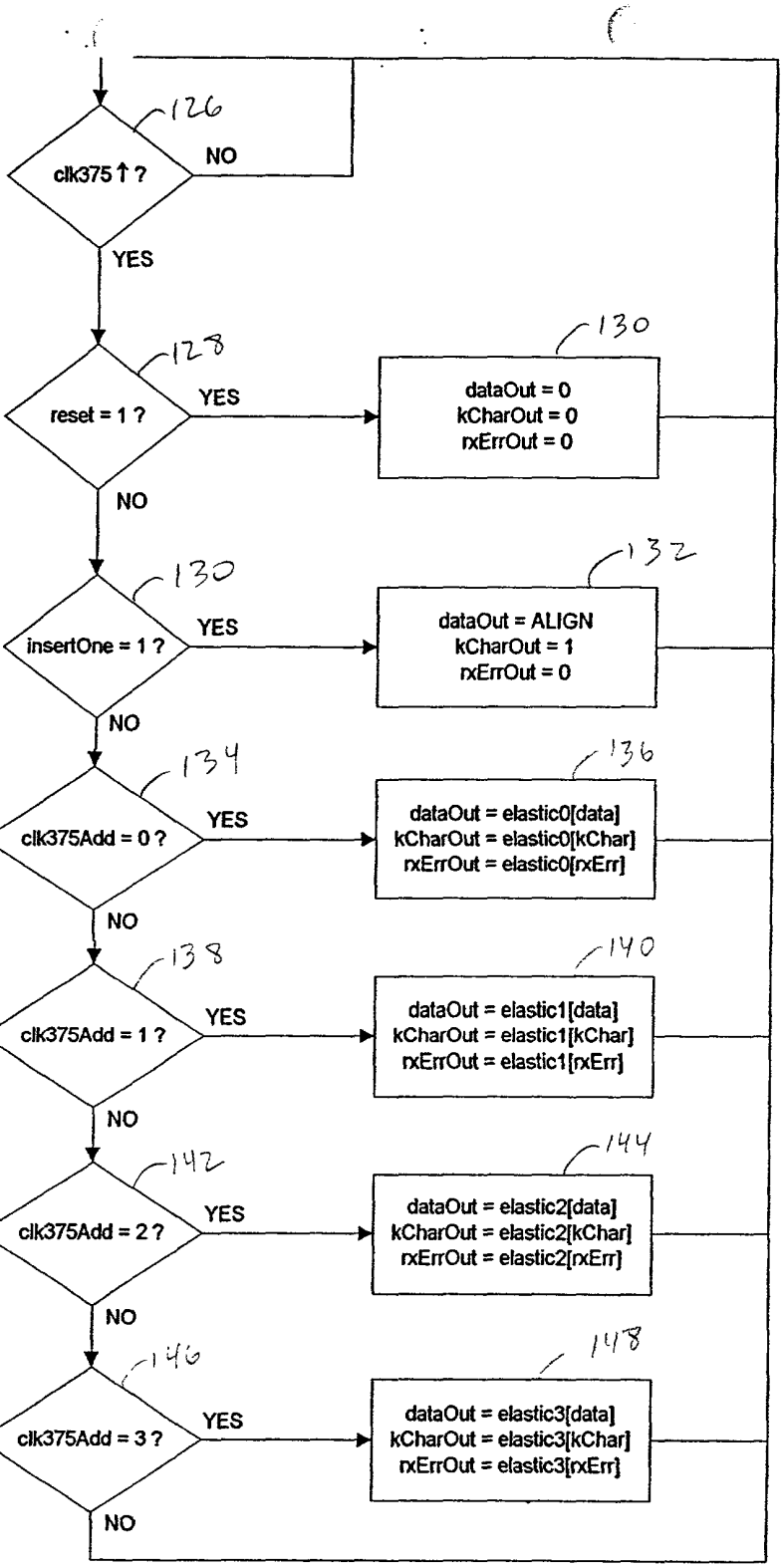
FIG. 5



Title

the memories, 4 words, written by rclk, and read by clk375, with an address difference of two, or one at worst

FIG. 6A


126
clk375↑?
NO
YES
128
reset = 1 ?
YES
130
dataOut = 0
kCharOut = 0
rxErrOut = 0
NO
130
insertOne = 1 ?
YES
132
dataOut = ALIGN
kCharOut = 1
rxErrOut = 0
NO
134
clk375Add = 0 ?
YES
136
dataOut = elastic0[data]
kCharOut = elastic0[kChar]
rxErrOut = elastic0[rxErr]
NO
138
clk375Add = 1 ?
YES
140
dataOut = elastic1[data]
kCharOut = elastic1[kChar]
rxErrOut = elastic1[rxErr]
NO
142
clk375Add = 2 ?
YES
144
dataOut = elastic2[data]
kCharOut = elastic2[kChar]
rxErrOut = elastic2[rxErr]
NO
146
clk375Add = 3 ?
YES
148
dataOut = elastic3[data]
kCharOut = elastic3[kChar]
rxErrOut = elastic3[rxErr]
NO

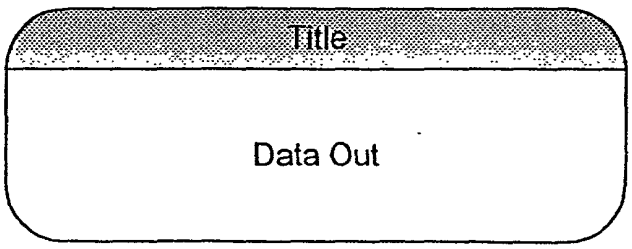
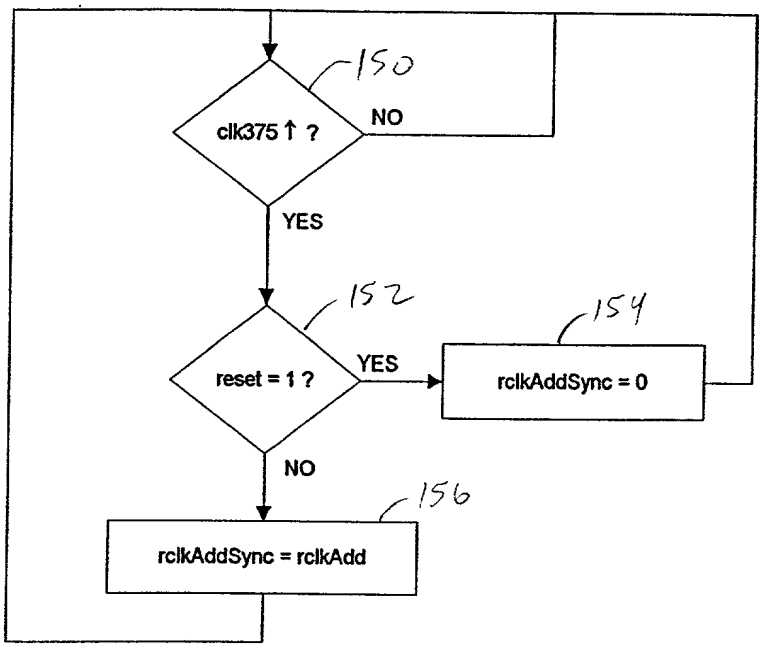

Title
Data Out

FIG. 6B


150
clk375 ↑ ?
NO
YES
152
reset = 1 ?
YES
154
rclkAddSync = 0
NO
156
rclkAddSync = rclkAdd

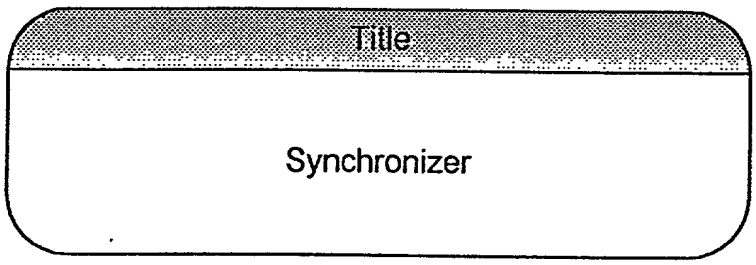
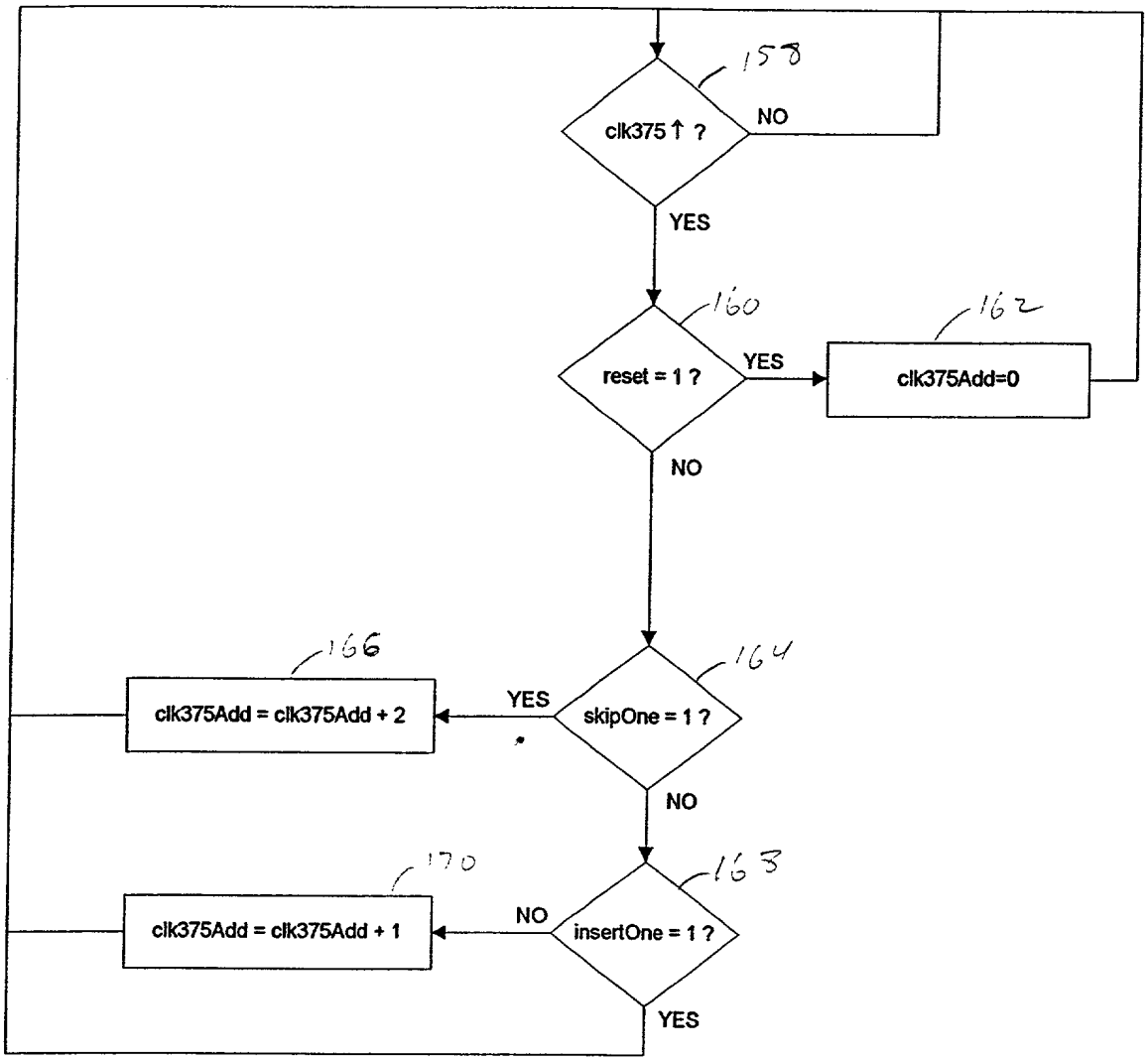

Title
Synchronizer

FIG. 6C



Title

The Two Counters

FIG. 6D

Shift register of distance between two counters is greater than two (delete 1), or less than two (insert 1).
Condition that will cause deletion of an align.
rClkAhead 0 <= distanceGT2 — 186
rclkAhead 1 <= rclkAhead 0 — 188
rclkAhead <= rClkAhead0 & rClkAhead1 — 184

Condition that will cause insertion of an align.
clk375Ahead0 <= distanceLT2 — 190
clk375Ahead 1 <= clk375Ahead0 — 192
clk375Ahead <= clk375Ahead0 & clk375Ahead1 — 182

180

Distance calcualtion:
distance = rclkAddSync - clk375Add
distanceGT2 = (distance > 2)
distanceLT2 = (distance < 2)

178

Constant comparison of 4 data words to align character. Keeps track of when an align is at the data out. Insertion or deletion will happen at this time.
Output signals:
elastic0Align = elastic0 == ALIGN
elastic1Align = elastic1 == ALIGN
elastic2Align = elastic2 == ALIGN
elastic3Align = elastic3 == ALIGN

176

insertOne calculation.
clk375Ahead & (
((clk375Add = 0) & elastic0Align) | — 174
((clk375Add = 1) & elastic1Align) |
((clk375Add = 2) & elastic2Align) |
((clk375Add = 3) & elastic3Align) |

172

Title

Insert/delete comparisons

FIG. 7